Remarks

The examiner's reconsideration of the application is requested in view of the specification revision above and comments which follow.

Turning to matters raised in the office action, responsive to numbered paragraph 3 on page 2 of the office action, an appropriate correction to the specification has been made, as required.

In numbered paragraphs 4 through 6 beginning on page 2 of the office action, the examiner has rejected independent claim 1, and certain of the dependent claims, under 35 U.S.C. §102 as being anticipated by Isogai U.S. Patent Number 6,188,093 or Takemoto U.S. Patent Number 4,148,048. Reconsideration is requested, and no claim amendments have been made because it is submitted that, upon reconsideration, no claim amendments are necessary to distinguish from the prior art.

The Examiner seems to have misunderstood the term "non-carrier storing, carrier collecting region" (claim 1). This term is meant to mean what it says: a region where carriers are collected but, however, not stored. Charges do not remain in that region: as soon as they get there they are taken away, attracted by an area of lower potential.

To try and make this easier to understand, following is an analogy: The combination of the "non-carrier storing, carrier collecting region" and the "non-carrier storing carrier transport pathway" can be compared to a roof with a gutter, as also mentioned in the present application

page 11, lines 14 – 29. The roof then functions as the "non-carrier storing, carrier collecting region", i.e. rain water is collected there, but is not stored there; it immediately flows away towards the gutter to be evacuated therefrom. The gutter functions as the "non-carrier storing carrier transport pathway", i.e. rain water coming from the roof is not stored or kept in the gutter, either. It flows away towards a rain pipe or a water barrel (which then corresponds to the "doped or inverted region of a first conductivity" where charges can accumulate).

Charges generated in the substrate by incidence of light are attracted by the "non-carrier storing, carrier collecting region" which is at a lower potential. From there, the charges immediately diffuse towards an area of still lower potential, the "doped or inverted region in or on the substrate".

The advantage of this arrangement is that the "charge runoff" is fast and complete. All the rainwater is collected by the roof and is made available for use. Nothing is left in pockets in the roof or gutter. This means that a maximum of charge is collected by the sensor and is useable for sensing purposes – there are little or no losses.

Isogai (US-6188093)

In the Isogai patent, the charge collection region (Fig.10, ref.12) is called an "accumulation region" (col.26 l.32-33), i.e. charge is not only collected there, but also accumulated, thus kept or stored. If this region would be a non-carrier storing region, charge would not be able to accumulate there, as accumulation of "things" (be it tangible things or

energy for example, or charges as in the present application) can only occur if a plurality of those "things" are brought to a certain place and are kept there.

In the introduction of the detailed description (column 14, lines 15 – 54) of Isogai, it is explained that the photodiode generates and accumulates an electric charge in response to incident light (column 14, lines 20 – 21). A transfer gate then transfers the electric charge generated and accumulated by the photodiode to a gate region of a JFET (column 14, lines 30 – 32). The JFET receives the electric charge at the gate region, and outputs a signal corresponding to this electric charge received at the gate region (column 14, lines 22 – 25).

Charges are evacuated from the charge accumulation regions if an excessive charge is generated at the photodiode of a pixel (column 26, lines 37 – 45). At that moment only the excess charges are evacuated, so charge is still accumulated at the charge collection region (column 14, line 66 – column 15, line 5).

The present invention is an improvement compared to this. By arranging the non-storing pathway, all the charges are transferred. This means that the claimed sensor is more sensitive than the prior art.

Takemoto (US-4148048)

In the Takemoto patent, Figure 2, there is an n-type diffused layer 12 and an n-type diffused layer 14. As explained in column 1, lines 59 – 67 of the Takemoto patent, charges are

created in the substrate when light is incident on the photodiode, and are stored there (column 1, line 62). When a suitable pulse is applied on the gate electrode, charges are drawn to the n-type diffused layer 14. Upon incidence of light, the n-type diffused layer stores charges until a pulse is applied to the gate (column 2, lines 1 – 5), i.e. charges are accumulated in the n-type diffused layer 12 from where they are evacuated at a moment in time. The charge-collecting region, which is formed by the n-type diffused layer 12, is thus a charge-storing region.

* * *

Therefore, none of the devices described in the cited prior art is provided with a "non-carrier storing, carrier collecting region". Instead, the carrier collecting region in the devices described in the prior art documents is a carrier storing region, i.e. a region where charges accumulate and are stored until they are transferred for read-out.

In the "non-carrier storing, carrier collecting region" according to the present invention, charges are taken away as soon as they arrive there. They are not stored there at any moment in time, just like rain water on a roof is not kept there, but is evacuated towards a gutter immediately. The charges pass by the "non-carrier storing, carrier collecting region", but they are not confined there. This provides a significant advantage if the sensor is to be used at low light levels, for example.

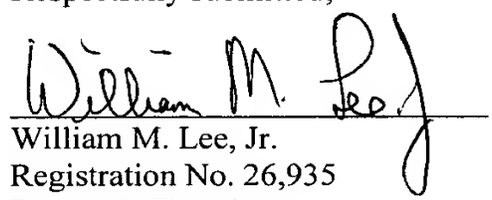
Therefore, it is submitted that the invention, as claimed, distinguishes from the prior art and is allowable thereover. The examiner's further and favorable reconsideration in that regard

is therefore urged.

Since this response is being sent during the fourth month following the examiner's office action (January 11, 2003 being a Saturday), an appropriate petition for extension of time is also submitted herewith.

January 13, 2003

Respectfully submitted,



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Version With Markings To Show Changes Made

Page 2, lines 19 – 20:

However, the image quality of pixels with CMOS-technology is still less [advanved] advanced than image quality of pixels with CCD-technology.